

CLAIMS

What is claimed is:

1. A write once disc, comprising:
at least one record layer on which data is recorded;
a temporary defect management area having first temporary defect information regarding only a defect in the recorded data detected during a corresponding first recording operation other than a prior recording operation, and first temporary defect management information for managing the first temporary defect information; and
at least one defect management area in which the temporary defect information and temporary defect management information recorded in the temporary defect management area are recorded as defect information and defect management information, respectively,
wherein the defect information and defect management information and/or the temporary defect information and temporary defect management information are used by a recording and/or reproducing apparatus to perform defect management with respect to the data recorded on the at least one record layer.
2. The write once disc of claim 1, wherein the at least one defect management area comprises at least two defect management areas.
3. The write once disc of claim 1, wherein the temporary defect information and temporary defect management information are recorded as a pair of information adjacent to each other in the temporary defect management area.
4. The write once disc of claim 3, wherein the temporary defect information and temporary defect management information are recorded several times, and the temporary defect management information includes information regarding a location of corresponding temporary defect information.
5. The write once disc of claim 3, wherein the temporary defect management information includes information regarding a location of previous temporary defect information recorded in the prior recording operation before the first temporary defect information.

6. The write once disc of claim 1, further comprising a replacement area in which a replacement is recorded to replace the defect in the recorded data, wherein the temporary defect information includes a pointer pointing to a location of the defect and a pointer pointing to a location of the replacement for the defect.

7. The write once disc of claim 6, wherein the temporary defect information further includes state information specifying and distinguishing between whether the defect occurs in one of continuous defect blocks and a single defect block.

8. The write once disc of claim 7, wherein the state information specifies that the defect occurs in the continuous defect blocks and that the pointer for the defect and the pointer for the replacement indicate starting positions of the defect and the replacement, respectively.

9. The write once disc of claim 7, wherein the state information specifies that the defect occurs in the continuous defect block and that the pointer for the defect and the pointer for the replacement indicate end positions of the defect and the replacement, respectively.

10. A method of managing disc defects, comprising:
recording only information regarding a defect detected in data, which is recorded in a data area of a disc during a recording operation having an index of i , where i is an integer, as i th temporary defect information in a temporary defect management area of the disc;
recording management information for managing the i th temporary defect information as i th temporary defect management information in the temporary defect management area;
repeating the recording temporary defect information and the recording the temporary defect management information at least once while increasing the index i given to the recording operation, the temporary defect information, and the temporary defect management information by 1 so as to record temporary defect information and temporary defect management information having only defect information for the corresponding one of the recording operations; and
reading and writing all of the recorded temporary defect management information and temporary defect information in a defect management area of the disc.

11. The method of claim 10, wherein the reading and writing is performed after recording of data in the data area according to a last recording operation.

12. The method of claim 10, wherein the recording the temporary defect information and the recording the temporary defect management information comprises sequentially recording the temporary defect information and the temporary defect management information as a pair of information adjacent to each other, starting from an end of the temporary defect management area.

13. The method of claim 12, wherein the recording the temporary defect information and the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information several times.

14. The method of claim 12, wherein the recording the temporary defect management information comprises recording information regarding a location of the temporary defect information corresponding to the temporary defect management information, and information regarding a location of temporary defect information recorded during another recording operation having the index of at least i-1.

15. The method of claim 10, wherein the recording the temporary defect information and the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information sequentially as a pair of information adjacent to each other, starting from an end of the temporary defect management area.

16. The method of claim 15, wherein the recording the temporary defect information and the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information several times.

17. The method of claim 15, wherein the recording the temporary defect management information comprises recording information regarding a location of the temporary defect information corresponding to the temporary defect management information, and information regarding a location of temporary defect information recorded during another recording operation having the index of at least i-1.

18. The method of claim 10, wherein the recording the temporary defect information comprises:

- recording the data in predetermined units during the *i*th recording operation;
- verifying the recorded data to detect a defective area of the disc where a defect exists;
- storing information regarding the defective area and information regarding a replacement area for the defective area as the *i*th temporary defect information in a memory of a recording apparatus;

- repeating the recording data in predetermined units and the verifying the recorded data at least once; and

- reading the information stored in the memory and writing the read information as the *i*th temporary defect information in the temporary defect management area when the recording operation ends.

19. A recording and/or reproducing apparatus comprising:

- a recording/reading unit that records data on and/or reads data from a disc; and
- a controller that controls the recording/reading unit to record in a temporary defect management area temporary defect information regarding a defect detected from a portion of the data recorded in a data area of the disc in a corresponding one of recording operation units, and to record in the temporary defect management area temporary defect management information for managing the temporary defect information in the temporary defect management area, where the temporary defect information does not include information regarding another defect detected during a prior recording operation unit.

20. The recording and/or reproducing apparatus of claim 19, wherein the controller controls the recording/reading unit to record corresponding temporary defect information and temporary defect management information as a pair of information adjacent to each other.

21. The recording and/or reproducing apparatus of claim 19, wherein the controller controls the recording/reading unit to record corresponding temporary defect information and temporary defect management information in the temporary defect management area for each of the recording operation units, and to read all of recorded temporary defect information and temporary defect management information and to record the read temporary defect information and temporary defect management information in a defect management area during disc finalization.

22. A recording and/or reproducing apparatus comprising:
a recording/reading unit that records data on and/or reads data from a disc; and
a controller that controls the recording/reading unit to record information regarding a defect detected from data, which is recorded in a data area of the disc according to recording operation having an index of i , where i is an integer as i th temporary defect information in a temporary defect management area; to record defect management information for managing the i th temporary defect information as i th temporary defect management information in the temporary defect management area; record data in the data area while increasing the index i given to a corresponding recording operation, a corresponding temporary defect information, and a corresponding temporary defect management information by 1; and to record all of the recorded temporary defect information and temporary defect management information in a defect management area during disc finalization.

23. The recording and/or reproducing apparatus of claim 22, wherein the controller controls the recording/reading unit to record data in the data area according to a last recording operation, and to record all of recorded temporary defect information and temporary defect management information as final defect information and defect management information, respectively, in the defect management area.

24. The recording and/or reproducing apparatus of claim 22, wherein the controller controls the recording/reading unit to sequentially record corresponding temporary defect information and temporary defect management information as a pair of information, starting from a start of the temporary defect management area.

25. The recording and/or reproducing apparatus of claim 22, wherein the controller controls the recording/reading unit to sequentially record corresponding temporary defect information and temporary defect management information as a pair of information, starting from an end of the temporary defect management area.

26. The recording and/or reproducing apparatus of claim 24, wherein the controller controls the recording/reading unit to record information regarding a location of the temporary defect information corresponding to the temporary defect management information and information regarding a location of temporary defect information recorded during another recording operation having the index of at least i-1.

27. The recording and/or reproducing apparatus of claim 22, further comprising a memory unit,

wherein the controller controls the recording/reading unit to record data in predetermined units according to a predetermined recording operation having a common index; verifies the recorded data to detect a defective area of the disc in which a defect exists; creates information regarding the defective area and information regarding a replacement area for the defective area; stores the created information as temporary defect information in the memory unit; and controls the recording/reading unit to record the data recorded in an area following the defective area in predetermined units according to the recording operation, read the temporary defect information from the memory unit, and record the read temporary defect information in the temporary defect management area.

28. A write once disc with at least one record layer, comprising:

a temporary defect management area having temporary defect information regarding only a defect in data recorded in the user data area detected during a corresponding recording operation without having information on another defect occurring during a prior recording operation, and temporary defect management information for managing the temporary defect information;

a temporary finalized defect management area having temporary finalized defect information that includes at least a portion of the temporary defect information recorded in the temporary defect management area, and temporary finalized defect management information for managing the temporary finalized defect information; and

at least one defect management area in which all of the recorded temporary defect information and temporary defect management information are recorded as defect information and defect management information, respectively, during disc finalization,

wherein:

the temporary defect information and the temporary defect management information are recorded as a pair of information in the temporary defect management area, and

the defect information and the defect management information and/or the temporary defect information and the temporary defect management information are used by a recording and/or reproducing apparatus for performing defect management with respect to the recorded data on the disc.

29. The write once disc of claim 28, wherein:
the temporary finalized defect management information is recorded whenever the temporary defect management information is recorded k times, and
 k is an integer that is more than or equal to 2.

30. The write once disc of claim 29, wherein the temporary finalized defect management information is obtained based on all temporary management information recorded when the temporary finalized defect management information is to be recorded.

31. The write once disc of claim 30, wherein the temporary finalized defect management information comprises all of the temporary defect information included in the temporary management information recorded when the temporary finalized defect management information is desired to be recorded.

32. The write once disc of claim 29, wherein the at least one defect management area comprises at least two defect management areas.

33. The write once disc of claim 28, wherein the temporary defect information and the temporary defect management information are recorded adjacent to each other in the temporary defect management area.

34. The write once disc of claim 28, wherein the temporary defect information and the temporary defect management information are recorded as a pair of information in the temporary defect management area in units of a predetermined number of blocks.

35. The write once disc of claim 33, wherein the temporary defect information and the temporary defect management information are recorded several times, and the temporary defect management information further includes information regarding a recording location of corresponding temporary defect information.

36. The write once disc of claim 33, wherein the temporary defect information includes a pointer pointing to the location of a defect and a pointer pointing to a location of a replacement area for the defect.

37. The write once disc of claim 35, wherein the temporary defect management area is divided into a plurality of parts, and a copy of the temporary defect information and the temporary defect management information are recorded in each of the plurality of parts.

38. A method of managing disc defects, comprising:
recording temporary management information that includes temporary defect information and temporary defect management information regarding data, which is recorded in a data area of a disc according to a recording operation having an index of i , where i is an integer, as i th temporary management information in a temporary defect management area in units of a predetermined number of blocks;
repeating the recording the i th temporary management information at least once while increasing the index i given to the recording operation and the temporary management information by 1;
recording temporary finalized defect management information, which is obtained based on all of the recorded temporary management information, in a temporary finalized defect management area whenever the temporary management information is recorded k times, wherein k is an integer more than or equal to 2;
repeating the recording the temporary management information, the repeating the recording the i th temporary management information while increasing the index i at least once, and the recording the temporary finalized defect management information at least once; and
reading all of the recorded temporary defect management information including temporary management information recorded in the temporary finalized defect management information and temporary defect information and recording the temporary defect management information and temporary defect information in a defect management area.

39. The method of claim 38, wherein the reading and recording the temporary defect management information are performed after recording of data in the data area according to a last recording operation.

40. The method of claim 38, wherein: the recording the temporary defect management information comprises sequentially recording the temporary defect information and the temporary defect management information as a pair of information adjacent to each other, starting from a start of the temporary defect management area.

41. The method of claim 40, wherein:
the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information repeatedly, and
each temporary defect management information specifies a location of a corresponding temporary defect information and a location of a temporary defect information that is recorded during another recording operation having the index of at least $i-1$.

42. The method of claim 41, wherein:
the disc includes a plurality of temporary defect management areas, and
the recording the temporary defect management information comprises recording a copy of the temporary defect information and the temporary defect management information in each of the plurality of temporary defect management areas.

43. The method of claim 38, wherein the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information sequentially as a pair of information adjacent to each other, starting from an end of the temporary defect management area.

44. The method of claim 43, wherein the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information repeatedly.

45. The method of claim 44, wherein:
the disc includes a plurality of temporary defect management areas, and
the recording the temporary defect management information comprises recording a copy of the temporary defect information and the temporary defect management information in each of the plurality of temporary defect management areas.

46. The method of claim 44, wherein:

the recording the temporary defect management information comprises recording the temporary defect information and the temporary defect management information repeatedly, and

each of the temporary defect management information specifies a location of corresponding temporary defect information and a location of temporary defect information that is recorded during another recording operation having the index of at least $i-1$.

47. The method of claim 38, wherein the recording the temporary defect management information comprises:

recording data in predetermined units during a corresponding recording operation having a common index:

verifying the recorded data to detect a defective area of the disc in which a defect exists;

storing information regarding the defective area and information regarding a replacement area for the defective area as temporary defect information in a memory of a recording apparatus;

repeating the recording the data, the verifying the recorded data, and the storing the information at least once; and

reading temporary defect information from the memory, and recording the temporary defect information and temporary defect management information for managing the temporary defect information in the temporary defect management area in units of a predetermined number of blocks, when the recording operation ends.

48. A recording apparatus comprising:

a recording/reading unit that records data on and/or reads data from a disc; and

a controller that controls the recording/reading unit to record temporary management information in a temporary defect management area in units of a predetermined number of blocks, wherein the temporary management information includes temporary defect information regarding data recorded in a data area of the disc according to a corresponding recording operation, and temporary defect management information for managing the temporary defect information; and to record temporary finalized defect management information obtained based on all of the recorded temporary defect management information in a temporary finalized defect management area whenever the temporary management information is recorded k times after k

recording operations.

49. The recording apparatus of claim 48, wherein the controller controls the recording/reading unit to record the temporary defect information and the temporary defect management information, which constitute the temporary defect information, as a pair of information to be adjacent to each other.

50. The recording apparatus of claim 48, wherein the controller controls the recording/reading unit to record information regarding the location of temporary defect information corresponding to the temporary defect management information, and information regarding the location of temporary defect information recorded in a prior recording operation right before the recording operation of the corresponding temporary defect information.

51. The recording apparatus of claim 48, wherein the controller controls the recording/reading unit to record defect information and defect management information, which is obtained based on all recorded temporary management information and temporary finalized defect management information, in a defect management area during disc finalization.

52. The recording apparatus of claim 48, wherein:
the disc includes a plurality of temporary defect management areas, and
the controller controls the recording/reading unit to record a copy of the temporary management information in each of the plurality of temporary defect management areas.